

Identity of *Quercus acuta* Thunb. (Fagaceae) Recorded from Taiwan and China

Hiroyoshi OHASHI^a, Kazuaki OHASHI^b and Hideki TAKAHASHI^c

^aBotanical Garden, Tohoku University, Sendai, 980-0862 JAPAN;
E-mail: ohashi@mail.tains.tohoku.ac.jp

^bLaboratory of Biochemistry and Molecular Biology,
Graduate School of Pharmaceutical Sciences,
Osaka University, Suita, Osaka, 565-0871 JAPAN;

^cThe Hokkaido University Museum, Hokkaido University, Sapporo, 060-0810 JAPAN

(Received on March 29, 2006)

Quercus acuta Thunb. or *Cyclobalanopsis acuta* (Thunb.) Oerst. has been recorded as distributed in Japan, Korea, Taiwan and China in most of floras published in Japan. The records for Taiwan and China are considered to be erroneous. The first record of the species from Taiwan is inferred from a misidentification *Lithocarpus brevicaudatus* (Skan) Hayata, although the voucher specimen was not found in the designated herbarium. The record of the species from China is regarded as a simple error. We recognize *Q. acuta* as endemic to Japan and southern Korea.

Key words: China, misidentification, *Quercus acuta* Thunb., *Quercus brevicaudata* Skan, Taiwan.

Quercus acuta Thunb. or *Cyclobalanopsis acuta* (Thunb.) Oerst. was described by Thunberg in Murray, *Systema Vegetabilium* ed. 14 (1784) and *Flora Japonica* (1784). The type is in UPS (cf. Thunberg Herbarium microfiche 22386) from Japan. The species is recorded in Japanese floras as distributed in Japan, Korea, Taiwan and China (Ohwi 1953, 1965a, 1965b, Kitamura and Murata 1979, Ohwi and Kitagawa 1983, 1992, Ohba 1989, 2006). In fact, the species occurs widely in Japan from northern Honshu westward from Miyagi Prefecture on the Pacific side and Niigata Prefecture on the Japan Sea side through Shikoku to Kyushu (Ohashi et al. 2006), and in Korea it occurs mainly in Cheju-do and Jeollanam-do (Lee 1996). However, there are no records of the species in floras published in Taiwan and China, and so far as we know, no specimens of the

species have been collected in these regions.

Quercus acuta Thunb. was recorded by Matsumura and Hayata (1906) from Taiwan for the first time and *Cyclobalanopsis acuta* (Thunb.) Oerst. first by Nakai (1939) from China. The record has been followed in Japan in floristic or monographic works as a distribution range of the species (Matsumura 1912, Makino and Nemoto 1925, 1931, Kudo 1930, Nakai 1939 and others cited above). However, *Q. acuta* has not been recorded in Taiwan in their floristic works, i. e., Kanehira (1936), Masamune (1936), Liu (1960), Li (1963), Liu and Liao (1976), Liao (1996), and Boufford et al. (2003), and in China, i. e., *Sylva Sinica* vol. 2 (Cheng 1985), *Flora Reipublicae Popularis Sinicae* vol. 22 (Huang and Chang 1998) and *Flora of China* vol. 4 (Huang et al. 1999). The name disappeared even as a synonym of

other species in these works. In this study we tried to make clear the identities of *Q. acuta* or *Cyclobalanopsis acuta* in Taiwan and China.

Quercus acuta Thunb. in Taiwan

Matsumura and Hayata (1906 on page 392) recorded *Quercus acuta* Thunb. from Taiwan as follows: “*Quercus acuta* Thunb.? Hab. Holisha, leg. S. Yano, anno 1897 (H. S.).” The determination of the species indicates a doubt followed by a question mark after the name. The specimen was borrowed by Matsumura and Hayata from the Herbarium of Sapporo Agricultural College, abbreviated as H. S., and returned to H. S. as stated in the foreword in their book. The H. S. means the present Herbarium SAPS, University Museum, Hokkaido University, Sapporo. The specimen is expected to be kept in SAPS, but Takahashi could not find it in all collections of Fagaceae at the moment. H. Ohashi tried to find it in TI and TNS for confirmation, but without success. We think the cited specimen, “S. Yano anno 1897 (H.S.)”, is probably lost.

During this search, Takahashi found a specimen determined by Matsumura as “*Quercus acuta* Thunb.” in SAPS (Fig. 1), but he added a note “I think” in Japanese after the Latin name on the label. He was the specialist on Japanese Fagaceae at that time (cf. Matsumura 1891), but the note means some doubt on his determination. This specimen was collected by Nariaki Konishi (written in Japanese) and numbered 17 on the label (it will be called Konishi 17 hereafter in this paper). Konishi found many fundamental species for the flora of Taiwan such as *Cunninghamia konishii* Hayata, *Taiwania cryptomerioides* Hayata, *Quercus konishii* Hayata, *Ficus konishii* Hayata and many others. The locality where the specimen was collected is written in Japanese as Nankokei, the Horisha area, Taiwan, and the date of collection is December 1902. The

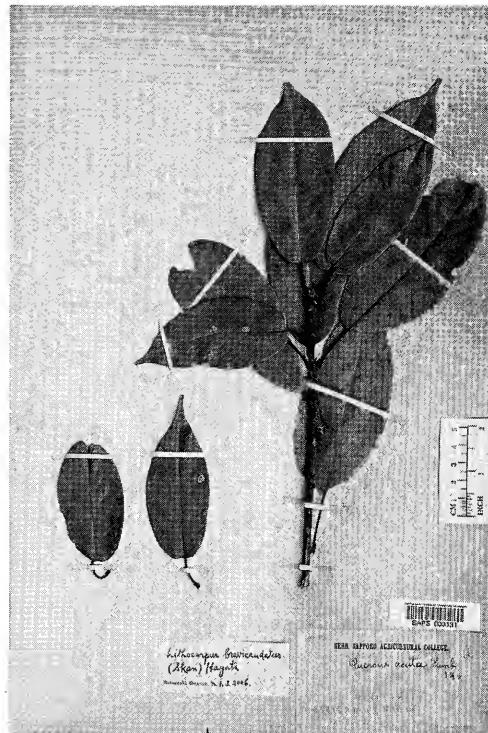


Fig. 1. The specimen Konishi 17 (SAPS).

locality corresponds to Nankanghsia, Puli ($23^{\circ}57'41''N$, $120^{\circ}57'35''E$), Nantou Province, Taiwan, at present. The specimen was collected along the river Nankanghsia in the Puli area.

The handwriting on the label of Konishi 17 by Matsumura means the same with the record of Matsumura and Hayata (1906), although with a question mark after the name in Matsumura and Hayata (1906) while with a note “I (= Matsumura) think” after *Quercus acuta* Thunb. on Konishi 17 (Fig. 1). The collected place of the specimen, Nankokei in the Horisha area, shows a detailed locality in Horisha that is the same locality with Holisha in the original record, hence both localities may be close or possibly the same. Although Konishi 17 was not cited in Matsumura and Hayata (1906) under



Fig. 2. Holotype of *Quercus brevicaudata* Skan (K).

"*Quercus acuta* Thunb.?", but the data on the label strongly suggested that the Konishi 17 belongs to the same species with the originally cited one, S. Yano anno 1897.

The specimen Konishi 17 is a vegetative branch of which the lower half is of previous year's with one leaf and the upper half is of current year's with eight leaves, and has two separate leaves (Fig. 1). There are a few juvenile winter buds on the top of branch and the buds are surrounded by deltoid bracts each with a long acuminate apex, ca. 6 mm long. The terminal winter bud is globose with many scales, larger than terminally lateral buds and the scales are spirally imbricate, broadly ovate. The petioles are 2–3.3 cm long, and the laminas are coriaceous, elliptic to oblong, 9–12.3 cm long, 3.6–5.3 cm wide, apex acuminate, base rounded, sometimes oblique; primary lateral veins 10–12 pairs, abaxially prominent, looped within margin; reticulate veins of ultimate areoles scarcely prominent on abaxial surface. The most prominent feature of the leaves is its equally rounded base, although there is one cuneate juvenile leaf on the current year's.

This specimen was compared with those of *Quercus acuta* collected in Japan. The winter bud of Konishi 17 differs from that of *Q. acuta* which has no bracts at base and is ovoid-conical. The leaves are very similar to each other, but primary lateral veins of *Q. acuta* are fewer than that of Konishi 17, i. e., usually eight pairs in *Q. acuta* when compare them with leaves of almost equal size to Konishi 17, and the reticulate veins of Konishi 17 are often less prominent than those of *Q. acuta*. We regard Konishi 17 as different from *Q. acuta*.

Liu and Liao (1976) regarded *Cyclobalanopsis paucidentata* (Franch. ex Nakai) Kudo & Masam. as a variety of *Cyclobalanopsis acuta*. The former is, however, revised by Liao (1996) as a synonym of *Cyclobalanopsis sessilifolia* (Blume) Schott. These species are distinct from *Cyclo-*

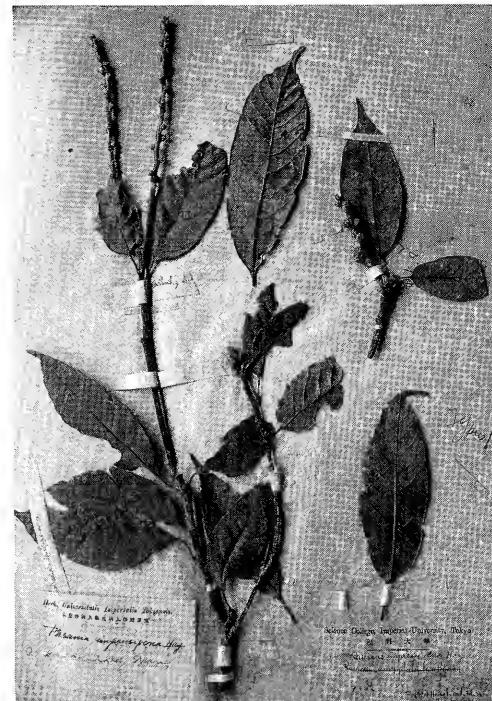


Fig. 3. Holotype of *Quercus impressivena* Hayata collected by Owatari on 21 January 1898 (TI).

balanopsis acuta in having short petioles and usually narrowly elliptic leaf laminas. The specimen Konishi 17 is neither referable to *Cyclobalanopsis paucidentata* nor *Cyclobalanopsis sessilifolia*.

Accordingly, if Konishi 17 is referable to the same species with S. Yano, anno 1897 (H. S.), *Q. acuta* recorded by Matsumura and Hayata (1906) from Taiwan is erroneous and *Q. acuta* does not occur in Taiwan.

On the other hand, Konishi 17 is referable to *Quercus brevicaudata* Skan (= *Lithocarpus brevicaudatus* (Skan) Hayata). This species was found at South Cape in Taiwan, and the lamina of leaves are oblong-elliptic, 11–12 cm long, 5 cm wide, rounded at the base in the original description (Skan in Forbes and Hemsley 1899). Leaves of the type of *Quercus brevicaudata* show a slight



Fig. 4. *Quercus impressivena* Hayata collected by Owatari in January 1898 (TI).

variation in the lamina base from rounded to shortly acuminate (Fig. 2). This species is recorded as very common in Taiwan in forests at low and medium altitudes from 500–2000 m (Li 1963). It is also distributed widely in southern provinces in continental China (Huang et al. 1999). The species appears to be variable in Taiwan and China and the shape of leaf laminas of Konishi 17 as well as the type of *Quercus brevicaudata* are somewhat different from common forms.

However, *Quercus brevicaudata* Skan was already included in Matsumura and Hayata (1906) based on specimens collected by C. Owatari in "Suiteiryō" and "Niki" in 1898. There are two voucher specimens in TI. One of them is the type of *Q. impressivena* Hayata (Fig. 3) and the other is that collected by Owatari in Jan. 1898 (Fig. 4). Remarkable

differences between these specimens and Konishi 17 are the shape of leaves, i. e., narrowly ovate or narrowly elliptic with attenuate lamina base in Matsumura and Hayata's *Quercus brevicaudata*, while rounded in Konishi 17. Matsumura and Hayata probably regarded "S. Yano, anno 1897 (H. S.)" as different from *Quercus brevicaudata* in their circumscription by the leaf shape.

We consider, therefore, that *Quercus acuta* Thunb. recorded by Matsumura and Hayata (1906) from Taiwan is erroneous, although we inferred that the specimen Konishi 17 is the same species with "S. Yano, anno 1897 (H. S.)".

Quercus acuta Thunb. in China

Quercus acuta Thunb. as *Cyclobalanopsis acuta* (Thunb.) Oerst. was recorded first by Nakai (1939) from China. He listed China within the area of distribution of the species, but he cited neither references nor voucher specimens of the species from China. There are no Chinese specimens of *Cyclobalanopsis acuta* determined by Nakai in TI, although his determinations on most of other species adopted in his paper (Nakai 1939) are remaining on species covers. Nakai (1939) also cited a Chinese name of his *Cyclobalanopsis acuta*, but the Chinese name corresponds to *Castanopsis sclerophylla* (Lindl.) Schott. (Huang and Chang 1998). We suppose, therefore, the record of Nakai was erroneous.

Conclusion

We concluded that the records of *Quercus acuta* Thunb. are erroneous in Taiwan and China. This species is considered to be native to Japan and southern Korea.

The erroneous records may be treated better as follows:

Lithocarpus brevicaudatus (Skan) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72 (1917); Rehder in J. Arnold Arb. 1: 123 (1920); Kaneh., Formosan Trees Revised:

102, fig. 55 (1936); C. G. Huang, Y. T. Zhang & Barthol., Fl. China 4: 366 (1999).

Quercus brevicaudata Skan in Forbes & Hemsl. in J. Linn. Soc. Bot. 26: 508 (1899) [Type: Formosa: South Cape (A. Henry 1368, K)]; Matsum. & Hayata in J. Coll. Sci. Imp. Univ. Tokyo 22: 393 (1906); Kaneh., Formosan Trees: 559, fig. 657 (1936).

Pasania brevicaudata (Skan) Schottky in Engler Bot. Jahrb. 47: 666 (1912); Nakai in J. Jap. Bot. 15: 270 (1939); Li, Woody Fl. Taiwan: 95 (1963); Liu & Liao, Fl. Taiwan 2: 84, pl. 220 (1976).

Quercus acuta auct. non Thunb.: Matsum. & Hayata in J. Coll. Sci. Imp. Univ. Tokyo 22: 392 (1906); Matsum., Index Pl. Jap. 2: 25 (1912), p.p. incl. Hab. Formosa cet excl.; Ohwi, Fl. Jap.: 377 (1965), p.p. incl. Hab. China cet excl.; H. Ohba in Satake & al., Wild Flow. Jap. Woody Pl.: 74 (1989), p. p. incl. Hab. Taiwan et China, cet excl.; Ohwi & Kitag., New Fl. Jap. revised: 560 (1992), p. p. incl. Hab. China, cet excl.; H. Ohba in K. Iwats. & al. (eds.), Fl. Jap. IIa: 50 (2006), p. p. incl. Hab. Taiwan et China, cet. excl.

Cyclobalanopsis acuta auct. non (Thunb.) Oerst.: Nakai in J. Jap. Bot. 15: 196 (1939), p. p. incl. Hab. Taiwan et China, cet excl.

We thank the curators of TI and TNS for allowing access to their material. We also thank Professor Emeritus T. C. Huang of the National Taiwan University, for search of duplicate specimens of S. Yano anno 1897 and Konishi 17 (SAPS) in TAI, although they were not found. We are grateful to Dr. Lourdes Rico Arce of Royal Botanic Gardens, Kew, for finding the type and authentic specimens of *Quercus brevicaudata* Skan in the Kew herbarium. The Board of Trustees of Royal Botanic Gardens, Kew, for allowing us to use the image data of the type of *Q. brevicaudata* Skan is gratefully acknowledged.

References

Boufford D. E., Ohashi H., Huang T. C., Hsieh C. F., Tsai J. L., Yang K. C., Peng C. I., Kuoh C. S. and Hsiao A. 2003. A checklist of the vascular plants of Taiwan. In: Editorial Committee of the Flora of Taiwan, Second Edition (ed.), Flora of Taiwan ed. 2. 6: 15–139. Department of Botany, National Taiwan University, Taipei.

Cheng W. C. (ed.) 1985. *Sylva Sinica* 2. China Forestry Press, Beijing.

Huang C. C. and Chang Y. T. 1998. *Lithocarpus*. In: Chun W. Y. and Huang C. C. (eds.), Fl. Reipublicae Popularis Sinicae 22. pp. 80–211. Science Press, Beijing (in Chinese).

—, Zhang Y. T. and Bartholomew B. 1999. Fagaceae. In: Wu Z. Y. and Raven P. H. (eds.), Flora of China 4. Cycadaceae through Fagaceae. pp. 314–400. Science Press (Beijing) and Missouri Botanical Garden Press (St. Louis).

Kanehira R. 1936. Formosan Trees Indigenous to the Island (revised). 754 pp. Department Forestry, Government Research Institute, Formosa.

Kitamura S. and Murata G. 1979. Coloured Illustrations of Woody Plants of Japan. II. Hoikusha Publishing Co. Ltd., Osaka (in Japanese).

Kudo Y. 1930. *Nihon Yuuyô Jumoku Bunruigaku*. (revised). Maruzen, Tokyo (in Japanese).

Lee W. T. 1996. *Lineamenta Floraee Koreae*. 2383 pp. Academy Books, Seoul.

Li H. L. 1963. Woody Flora of Taiwan. 974 pp. Livingston Publishing Co., Pennsylvania.

Liao J. C. 1996. Fagaceae. In: Huang T. C. et al. (eds.), Flora of Taiwan 2: 51–123. Department of Botany, National Taiwan University, Taipei.

Liu T. S. 1960. Illustrations of Native and Introduced Ligneous Plants of Taiwan. vol. 1. College of Agriculture, National Taiwan University, Taipei.

— and Liao J. C. 1976. Fagaceae. In: Li H. L. (ed.), Flora of Taiwan 2: 49–104. Epoch Publishing Co., Ltd. Taipei.

Makino T. and Nemoto K. 1925. *Nippon-Shokubutsu-Sôran* [Flora of Japan]. Nippon Shokubutsu-soran Publishing Association, Tokyo (in Japanese).

— and — 1931. *Nippon-Shokubutsu-Sôran* [Flora of Japan]. Second Edition Revised and Enlarged. Shunyôdô Shoten, Tokyo (in Japanese).

Masamune G. (ed.) 1936. Short Flora of Formosa. The Editorial Department of Kudoa. Taihoku, Taiwan.

Matsumura J. 1891. Japanese species of *Quercus*. Bot. Mag. Tokyo 5(49): 75, 123, 159 (*Q. acuta*).

— 1912. Index Plantarum Japonicarum. 2 (Phanerogamae). Maruzen, Tokyo.

— and Hayata B. 1906. *Enumeratio Plantarum Formosanarum*. J. Coll. Sci. Imp. Univ. Tokyo,

Japan 22. 704 pp. 18 plates.

Nakai T. 1939. *Castanopsis, Pasania* and their allies in the Japanese Empire (I). J. Jap. Bot. 15: 185–204. (II). J. Jap. Bot. 15: 257–277 (in Japanese).

Ohashi H., Sasaki Y. and Ohashi K. 2006. The northernmost limit of distribution of *Quercus acuta* Thunb. (Fagaceae). J. Jpn. Bot. 81: 173–187.

Ohba H. 1989. Fagaceae. In: Satake Y., Hara H., Watari S. and Tominari T. (eds.), Wild Flowers of Japan Woody Plants 1: 66–78, pls. 39–58. Heibonsha Ltd., Publisher. Tokyo (in Japanese).

— 2006. Fagaceae. In: Iwatsuki K., Boufford D. E. and Ohba H. (eds.): Flora of Japan IIa: 42–60. Kodansha Ltd., Tokyo.

Ohwi J. 1953. Flora of Japan. Shibundo, Tokyo (in Japanese).

— 1965a. Flora of Japan, English ed. 1066 pp. Smithsonian Institution, Washington D. C.

— 1965b. Flora of Japan. Revised ed. 1560 pp. Shibundo, Tokyo (in Japanese).

— and Kitagawa M. 1983. New Flora of Japan. Shibundo Co., Ltd. Publishers, Tokyo (in Japanese).

— and — 1992. New Flora of Japan. Revised. Shibundo Co., Ltd. Publishers, Tokyo (in Japanese).

Skan S. A. 1899. Cupuliferae. In: Forbes F. B. and Hemsley W. B., An enumeration of all the plants known from China proper, Formosa, Hainan, Corea, the Luchu Archipelago, and the Island of Hongkong, together with their distribution and synonymy. J. Linn. Soc. Bot. 26: 505–525.

大橋広好, 大橋一晶, 高橋英樹: 台湾と中国から記録されたアカガシの正体

大井日本植物誌をはじめ北村・村田: 原色日本植物図鑑木本編, 日本の野生植物木本 I, Flora of Japan IIa など日本の主な植物誌でアカガシの記述を見ると, アカガシは日本と朝鮮の他に台湾と中国あるいはそのいずれかに分布すると書かれている。しかし, 台湾や中国の植物誌にはアカガシは記録されていない。この矛盾を解くために, 台湾と中国のアカガシの正体を調べてみた。

台湾からアカガシを最初に記録したのは, Matsumura and Hayata (1906) であり, p. 392に「*Quercus acuta* Thunb.? Hab. Holisha, leg. S. Yano, anno 1897 (H. S.)」と引用されている。この H. S. は札幌農学校標本室の略号である。同書のまえがきによれば, Yano 標本は同定のため, 松村任三博士らの要請で宮部博士を通して札幌農学校から送られ, 後に札幌に返されたと書かれている。札幌農学校標本室は今日の北海道大学総合博物館ハーバリウム SAPS の前身である。しかしこの標本は SAPS のブナ科の中には見つからなかった。

ところが, 松村任三が「アカガシと考う」と同定した「台湾埔里社方面南港溪 Dec. 1902小西成章」という標本が SAPS で見付かった(図 1)。ラベル左上に No. 17 とある。われわれは松村による「*Quercus acuta* Thunb.?」という同定は「アカガシと考う」という同定と同じ表現であると考える。したがって Konishi 17 を松村は「S. Yano, anno 1897 (H. S.)」と同じ種類であると見なしたと推定した。

Konishi 17 はタイプ (Fig. 2) とも比較した結果, *Quercus brevicaudata* Skan (= *Lithocarpus brevi-*

caudatus (Skan) Hayata) と同定できた。そうすると「S. Yano, anno 1897 (H. S.)」も *Lithocarpus brevicaudatus* (Skan) Hayata であると推定して良いと思われる。したがって, Matsumura and Hayata による台湾からのアカガシの記録は *Lithocarpus brevicaudatus* の誤同定に基づくものであったと考えられる。

一方, 中国のアカガシの記録は中井 (1939) がアカガシの分布域に中国大陆を含めたことに始まるのではないかと思われる。中井はこの論文の中でアカガシの分布を「あかがし(支那名, 血櫟) 本島, 四国, 九州, 台湾, 朝鮮, 支那」と明記した。しかし, ここで標本は引用されていない。中国植物誌 (Huang and Chang 1998) によると, 血櫟は *Castanopsis sclerophylla* (Lindl.) Schott. の中国名であり, アカガシを意味しない。東大ハーバリウムのカシ類の標本は中井によって, 多分本誌 15 卷 4, 5 号 (1939) に発表した論文をまとめた際に整理したと思われるが, スピース・カバーに中井 (1939) の採用した学名が記入されている。しかし, 中国からのアカガシ標本は見つからなかった。中国からのアカガシの記録は間違いであったと考えられる。

以上のように, アカガシは日本と韓国南部に分布する種であり, 台湾や中国には分布しないと考えられる。

(^a東北大学植物園津田記念館,
^b大阪大学大学院薬学研究科分子生物学分野,
北海道大学総合博物館)